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STUDENTS' ALGEBRAIC THINKING PROCESS BASED ON REFLECTIVE AND IMPULSIVE COGNITIVE STYLES

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ABSTRACT

Algebraic thinking is very important because it helps students expand their thinking in solving concrete problems through the ability to identify patterns, recognize relationships between mathematical elements, and understand the structure of a problem. This study aims to analyze the differences in students' algebraic thinking process abilities based on reflective and impulsive cognitive styles. The research method used is a descriptive quantitative method. The subjects of the study were 27 high school students in grade 10. The instruments used in this study consisted of Matching Familiar Figure Test (MFFT) cognitive style test questions, algebra ability test questions, and interview guidelines. The data analysis technique in this study used data triangulation. The results of the analysis showed that students with a reflective cognitive style had an average algebra score of 84 and showed more consistent performance, compared to impulsive students who had an average score of 67. Interview findings supported the quantitative results, where reflective students tended to be thorough, focused on understanding concepts, and careful in solving problems, while impulsive students worked on problems quickly but lacked analysis, resulting in more frequent technical errors. This data triangulation confirmed that cognitive style had a significant effect on students' thinking and performance in solving algebra problems. This study recommends the application of Polya's step-based problem-based learning method for reflective students and game-based learning with self-monitoring strategy for impulsive students as an effort to improve mathematical problem-solving abilities.

Keywords: Thinking Process, Cognitive Style, Reflective, Impulsive, Algebra.

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PRELIMINARY

Algebra is fundamental to many fields of science, especially mathematics, because it provides symbolic structures and operating rules used to represent and manipulate relationships between variables (Musyrifah et al., 2023). Almost all materials in mathematics, such as functions, equations, analytical geometry, and calculus, use algebra as a tool to structure and solve problems. Algebraic thinking, which includes the ability to recognize patterns, construct generalizations, represent mathematical situations in symbolic form, and understand and manipulate relationships between variables, is at the heart of the application of algebra in the mathematical thinking process (Agoestanto et al., 2019;

Maudy et al., 2018). By thinking algebraically, students are not only able to solve mathematical problems procedurally, but can also develop a deeper conceptual understanding of complex mathematical structures, as well as the ability to solve non-routine problems (Aprildat & Hakim, 2021; Kusumaningsih et al., 2020).

Algebraic thinking is essential because it helps students expand their thinking in solving concrete problems through the ability to identify patterns, recognize relationships between mathematical elements, and understand the structure in a problem (Acosta et al., 2024; Sun et al., 2023). More than just the ability to manipulate symbols, algebraic thinking allows students to build generalizations from specific situations, and understand the concepts of variables and change. These abilities are very useful in modeling real-world problems, such as predicting population growth, calculating profits in business, or analyzing scientific data, using symbolic representations and mathematical functions (Levin & Walkoe, 2022; Musyrifah et al., 2023). In addition, algebraic thinking trains students to develop systematic and flexible problem-solving strategies, encouraging students to evaluate various approaches and adjust solutions according to the context of the problem at hand (Febriandi et al., 2023; Pitta-Pantazi et al., 2020). This means that algebraic thinking involves the ability to understand and use algebraic concepts in the context of mathematics and everyday life situations.

According to (NCTM, 2000) there are two main categories of algebraic thinking, namely 1) representation which involves the ability to represent mathematical problems in various forms, including verbal, graphic, symbolic, and tables. Representation helps students to understand problems more deeply and find more efficient solutions; 2) relationships and generalizations which involve the ability to identify relationships between variables and find patterns in data. Students can learn to make generalizations from the patterns found. According to (Sibgatullin et al., 2022), there are three basic skills that are indicators of algebraic thinking, namely models (patterns), notation, and variables.

Given the importance of algebraic thinking in helping students solve various everyday problems, educators need to realize that each student has a unique and diverse way of thinking (R. A. Dewi & Priatna, 2025). Understanding the algebraic thinking process is key to guiding students to solve problems effectively and efficiently, because algebraic thinking includes the ability to recognize patterns, model situations, and make mathematical generalizations (Bilbao et al., 2024; Febriandi et al., 2023). In this context, it is important for educators to review students' thinking processes through the perspective of cognitive style, namely the way individuals obtain, manage, and use information.

Cognitive style affects how students understand concepts, choose strategies, and complete mathematical tasks, including algebraic thinking (Saputra et al., 2025). Students with different cognitive styles can show certain advantages or challenges in solving problems. Therefore, educators need to adjust the learning approach based on students' cognitive styles in order to create a more effective and adaptive algebra learning process (Sucipto et al., 2025).

The importance of knowing students' algebraic thinking based on cognitive style for educators (Pratama & Masduki, 2024; Yusrina et al., 2023), namely (1) educators can know the development of students' cognitive abilities in solving problems; (2) educators can quickly detect students' misunderstandings in understanding concepts; (3) educators can adjust teaching methods and provide appropriate examples to clarify concepts; (4) educators can provide more specific feedback and help improve students' understanding; and (5) help educators to design activities that encourage the development of students' skills in critical, communicative, and mathematical thinking.

Cognitive style is an individual's way of processing, understanding, and responding to information received, and plays an important role in influencing how students learn and solve problems (Bègue, 2025; Glomb et al., 2025). Cognitive style is not only limited to reflective and impulsive, but also includes various other dimensions such as field dependent and field independent styles, verbal and visual styles, and analytical and holistic styles (Melinda et al., 2025; Ye & Li, 2025). However, in this study the focus of the cognitive style used is reflective and impulsive, which refers to the dimensions of speed and accuracy in decision making (Kagan, 1965; Saputra et al., 2025).

Based on the description above, the objectives of this study are: (1) to describe the algebraic thinking methods of students with a reflective cognitive style, and (2) to describe the algebraic thinking methods of students with an impulsive cognitive style. The novelty of this study lies in the integration of the analysis of the algebraic thinking process with the characteristics of reflective and impulsive cognitive styles which have rarely been studied in depth in the context of mathematics learning in Indonesia, especially on the topic of algebra. Most previous studies tend to focus on learning outcomes or differences in cognitive styles in a general context, without revealing how cognitive styles specifically affect the stages of algebraic thinking (Bilbao, Bravo, García, et al., 2024; Levin & Walkoe, 2022). In fact, understanding the algebraic thinking process based on cognitive style is very important to reveal students' internal strategies in identifying patterns,

constructing symbolic representations, and solving problems systematically (Sun et al., 2023).

This research is important to do because it can provide new contributions in the realm of mathematics education, especially in designing differentiated learning based on students' thinking styles. By knowing the characteristics of reflective and impulsive students' algebraic thinking, educators can design learning methods and strategies that are more targeted, adaptive, and able to accommodate the diversity of students' cognitive styles in solving complex mathematical problems.

METHODS

This study used a descriptive quantitative research method. The aim was to describe students' thought processes in solving algebraic problems. These thought processes were examined based on reflective and impulsive cognitive styles.

This research was conducted as a case study to examine the thought process of individuals with reflective and impulsive cognitive styles. The research was conducted at MA Daruttauhid Malang on March 20, 2023/2024 academic year. The subjects of the study were selected through the Matching Familiar Figure Test (MFFT) developed by (Herianto, 2020) which was adopted from the Matching Familiar Figure Test (MFFT) created by Jerome Kagan in 1965. The MFFT test is used to identify students' cognitive styles. The MFFT test was taken by 27 grade X students who had studied algebra material. Based on the results of the MFFT test, students who had a tendency towards a reflective cognitive style and a tendency towards an impulsive cognitive style were selected. Furthermore, 2 students who got the highest scores on the algebra ability test were taken to be interviewed, namely, 1 student with a reflective cognitive style and 1 student with an impulsive cognitive style.

The research instruments included MFFT to determine cognitive style, algebra ability test to explore the differences in thinking processes of students with reflective and impulsive cognitive styles, and semi-structured interview guidelines to explore thinking steps in depth. The research procedures included the preparation stage, implementation of MFFT and algebra test, and interviews. Data were analyzed using triangulation techniques through data reduction, data presentation, and drawing conclusions to identify patterns of thinking processes based on cognitive style. This study is expected to provide an overview of the differences in the algebraic thinking processes of reflective and impulsive students and their implications for appropriate learning methods and strategies.

Table 1. Students' Algebra Ability Indicators (NCTM, 2000)

No.	Aspects of Algebraic Ability	Indicator	Score Range (0-100)
1	Concept Understanding	Able to understand and explain basic concepts of algebra	0-59 = Less, 60-74 = Sufficient, 75-89 = Good, 90-100 = Very Good
2	Application of Algebraic Operations	Able to perform algebraic operations correctly	0-59 = Mostly wrong, 60-74 = Quite right, 75-89 = Almost right, 90-100 = All right
3	Accuracy of Calculation	Work on questions carefully and minimize calculation errors	0-59 = Not thorough, 60-74 = Not very thorough, 75-89 = Thorough, 90-100 = Very thorough
4	Problem solving	Able to solve story/contextual problems correctly	0-59 = Not able, 60-74 = Less able, 75-89 = Able, 90-100 = Very able
5	Systematic Procedure	Arrange the solution steps in a sequential and logical manner	0-59 = Not systematic, 60-74 = Not very systematic, 75-89 = Quite systematic, 90-100 = Very systematic

Table 1 presents indicators of students' algebraic abilities based on the standards of the National Council of Teachers of Mathematics (NCTM, 2000). There are five main aspects assessed, namely: (1) conceptual understanding, (2) application of algebraic operations, (3) calculation accuracy, (4) problem solving, and (5) systematic procedures. Each aspect has indicators that describe the competencies expected of students, as well as a range of assessment scores from 0 to 100 categorized into four levels of achievement. This score classification is used to measure the extent to which students have mastered each aspect of algebraic abilities qualitatively, so that it can be used as a basis for evaluating and developing more effective mathematics learning.

Table 2. Indicators of Reflective and Impulsive Cognitive Styles (Kagan, 1965)

No.	Cognitive Aspect	Reflective Indicator	Impulse Indicator	Score Range (0-100)
1	Decision Making Time	Long, thoughtful	Fast, hurry	0-59 = Hasty, 60-74 = Less stable, 75-89 = Careful, 90-100 = Very careful
2	Accuracy	Careful, rarely makes mistakes	Lack of attention to detail, missing details	0-59 = Not thorough, 60-74 = Not very thorough, 75-89 = Thorough, 90-100 = Very thorough
3	Reexamination	Double check often	Rarely or never double check	0-59 = Never, 60-74 = Rarely, 75-89 = Sometimes, 90-100 = Always double check
4	Problem Solving Strategy	Systematic, analytical	Answer straight away without strategy	0-59 = Not systematic, 60-74 = Less systematic, 75-89 = Good enough, 90-100 = Very systematic
5	Reaction to Mistakes	Analyze and correct errors	Ignoring or not realizing mistakes	0-59 = Not aware, 60-74 = Not corrected, 75-89 = Aware, 90-100 = Actively corrected

Table 2 describes indicators of reflective and impulsive cognitive styles based on Kagan's (1965) theory. These cognitive styles reflect individual differences in how they process information and make decisions, particularly in problem-solving contexts. Five main aspects used to identify an individual's cognitive tendencies are: (1) decision-making time, (2) thoroughness, (3) double-checking, (4) problem-solving strategies, and (5) reaction to errors. Each aspect is divided into two indicators: reflective (careful, cautious, and analytical) and impulsive (quick, thoughtless, and less thorough). A score range of 0–100 is used to quantitatively assess the tendencies of each style, with quality descriptions indicating the extent to which the reflective or impulsive characteristics are displayed by the individual. This table can be used to identify student learning characteristics and direct appropriate learning approaches.

RESULT AND DISCUSSION

The study aims to describe the differences in students' algebraic thinking processes based on reflective and impulsive cognitive styles. The study includes four main results. First, the results of identifying students' cognitive styles are carried out to classify students into reflective or impulsive categories. Second, an algebraic ability test is carried out to see how students solve problems based on their respective cognitive styles. Third, the data is strengthened through in-depth interviews with students who get the highest scores, and fourth, data triangulation is carried out to ensure the validity of the research findings.

1. Results of Identification of Students' Cognitive Styles

The MFFT test used in this study was developed by Herianto, (2020) and adapted from the MFFT which was first created by Jerome Kagan in 1965. MFFT is an instrument used to assess impulsive and reflective cognitive styles, with a focus on measuring a person's thinking speed or cognitive tempo. Based on the test results, subjects can be categorized into four groups, namely impulsive, reflective, fast-accurate (careful), and slow-inaccurate. The MFFT test consists of two parts, namely one standard image (standard) and five variation images (stimuli), where only one of the five images is identical to the standard image. There are 13 question items in the MFFT test designed to identify the type of cognitive style of students. The test in this study was taken by 27 MA class X students with the MFFT test results presented in Table 3 as follows.

Table 3. MFFT Results Data

No.	Student Name	Time (t)	Correct Answer (f)	Cognitive Style
1	AM	9.01	9	Reflective
2	AA	8.55	7	Reflective

3	AI	6.03	7	Fast-Accurate
4	AL	6.64	5	Impulsive
5	ES	8.93	6	Slow-Inaccurate
6	FJ	4.52	5	Impulsive
7	MA	4.74	10	Fast-Accurate
8	MF	4.53	4	Impulsive
9	MI	4.07	7	Fast-Accurate
10	MK	7.46	5	Slow-Inaccurate
11	MS	7.41	5	Slow-Inaccurate
12	MU	7.99	3	Slow-Inaccurate
13	US	4.06	8	Fast-Accurate
14	PA	8.61	7	Reflective
15	AS	8.34	3	Slow-Inaccurate
16	AB	4.41	9	Fast-Accurate
17	AW	9.00	6	Slow-Inaccurate
18	AH	5.43	9	Fast-Accurate
19	AP	9.05	4	Slow-Inaccurate
20	HM	5.97	7	Fast-Accurate
21	MZ	5.69	4	Impulsive
22	MC	7.05	3	Impulsive
23	MT	6.58	5	Impulsive
24	MH	9.95	7	Reflective
25	RY	5.76	4	Impulsive
26	ST	9.85	5	Slow-Inaccurate
27	SA	5.92	8	Fast-Accurate

Based on Table 3, it is explained that there are 4 students who have a reflective cognitive style, namely AM, AA, PA, and MH with a time of $t > 7.28$ minutes and correct answers $f \geq 7$ questions. There are 7 students who have an impulsive cognitive style, namely AL, FJ, MF, MZ, MC, MT, and RY with a time of $t \leq 7.28$ minutes and correct answers $f < 7$ questions. Based on Table 1, it is also shown that 8 students, namely ES, MK, MS, MU, AS, AW, AP, and ST have a Slow-Inaccurate cognitive style, while 8 students, namely AI, MA, MI, US, AB, AH, HM, and SA have a Fast-Accurate cognitive style.

2. Results of Students' Algebra Ability Test

Next, from 4 students who have a reflective cognitive style and 7 students who have an impulsive cognitive style, they worked on the algebra ability test questions. The following is an explanation of the results of the algebra ability test of students who have a reflective cognitive style.

Table 4. Data on the Results of the Algebra Ability Test of Reflective Cognitive Style Students

No.	Student Name	Cognitive Style	Mark	Information
1	AM	Reflective	85	Very thorough, in-depth analysis, almost perfect results.

2	AA	Reflective	78	Be careful, some errors are due to miscalculation.
3	PA	Reflective	90	Strong, systematic and accurate conceptual understanding.
4	MH	Reflective	83	Full consideration, long work, good results.
Average			**84**	

Based on Table 4, it is shown that the highest score obtained by PA students was 90 with strong, systematic, and accurate conceptual understanding ability. The lowest score obtained by AA students was 78 with careful analytical ability and there were several miscalculation errors. Meanwhile, the average score of the algebra ability test results of students who have a reflective cognitive style was 84. Based on the average score, it is shown that students with a reflective cognitive style tend to analyze questions carefully before answering, resulting in accurate answers even though the processing time is longer. Students with a reflective cognitive style mostly have good algebraic concept understanding ability, as shown in PA students who got a score of 90 in the high category. The errors that occurred were generally technical in nature, such as miscalculations shown in AA students with a score of 78 in the low category. This is due to a greater focus on analysis than speed.

The results of the algebra ability test of students who have an impulsive cognitive style are shown in Table 5 as follows.

Table 5. Algebra Ability Test Results Data for Impulsive Cognitive Style Students

No.	Student Name	Cognitive Style	Mark	Information
1	AL	Impulsive	65	Fast but often less thorough
2	FJ	Impulsive	70	Fast, but less double checking of the results
3	MF	Impulsive	58	Many mistakes result from haste
4	MZ	Impulsive	72	Understand the problem well, rushed, missed some steps
5	MC	Impulsive	68	Fast but not thorough in rechecking
6	MT	Impulsive	75	Accurate on simple questions, often wrong on complex questions
7	RY	Impulsive	60	In a hurry, the concept is understood but there are many mistakes
Average			**67**	

Based on Table 5, it is shown that the highest score obtained by MT students was 75 with accurate solving ability on simple questions and often made mistakes on complex questions. The lowest score obtained by MF students was 58 with many errors due to haste. Meanwhile, the average score of the algebra ability test results of students with an impulsive cognitive style was 67. Based on the average score, it is shown that students

with an impulsive cognitive style tend to complete tests quickly and often sacrifice the accuracy of their answers. Students with an impulsive cognitive style are less careful, this is indicated by errors that often occur due to rushing and not rechecking their answers, as shown in MF students who scored 58 in the low category and RY students who scored 60 in the low category. Based on this, students with an impulsive cognitive style have varying abilities in understanding concepts. There are some students who are able to answer simple questions well but have difficulty with complex questions, as shown in MT students with a score of 75.

3. Student Interview Results

The following are the results of interviews with students who have the highest algebra ability test scores, both students who have a reflective cognitive style and students who have an impulsive cognitive style.

Reflective Cognitive Style Student Interview Results (Students: PA)

MFFT Test Time: > 7.28 minutes

Number of Correct Answers: ≥ 7 questions

Algebra Test Score: 90 (high category)

Interview:

Researcher : *How do you feel when working on cognitive and algebra test questions?*

PA : *I feel like I need time to understand each question first. So I read it slowly, I think about it before choosing an answer. I feel more comfortable that way so I don't make mistakes.*

Researcher : *So you deliberately don't rush, huh?*

PA : *Yes, I don't like to rush, I'm afraid of making mistakes. Especially algebra questions, because sometimes the formulas are similar, so I make sure the method and numbers are correct first.*

Researcher : *When working on algebra questions, which part do you think is the easiest and most difficult?*

PA : *The easiest is when you already know the pattern, like factorization questions. But sometimes I miscalculate a little, maybe because I focus too much on the method, so I forget to double-check the final result.*

Researcher : Why do you think you can get high scores?

PA : *Because I prefer to understand the concept first. So if I understand, any question can be adjusted. I also like to practice, so I'm more confident.*

Based on the results of interviews with PA students, it was shown that PA tended to be careful and thorough in solving problems. PA stated that it took longer because he wanted to make sure he understood the problem before giving an answer. PA focused more on analysis and conceptual understanding than speed, especially in solving algebra problems. This is in line with his high algebra test results, namely 90, where conceptual understanding is the key to success. However, PA also admitted that he sometimes made technical errors, such as miscalculations, due to being too focused on the work process. Overall, a careful and in-depth approach to thinking enabled PA to understand algebra material well, even though it took longer to solve the problems.

Interview Results of Impulsive Cognitive Style Students (Students: MT)

MFFT Test Time: ≤ 7.28 minutes

Number of Correct Answers: < 7 questions

Algebra Test Score: 75 (moderate category)

Interview:

Researcher : *How did you do the cognitive and algebra test questions yesterday?*

MT : *I just answered it straight away if I felt like I knew the answer. I don't like to think too long, sometimes it just makes me confused.*

Researcher : *Do you often double-check your answers?*

MT : *Rarely, usually once I've chosen I move on to the next question. Because the time is also limited, I'm afraid I won't finish.*

Researcher : *What do you think about algebra questions?*

MT : *Sometimes it's easy, but I often get confused when it comes to stories or long formulas. I usually try to quickly remember the formula, then do it straight away.*

Researcher : *Do you feel like your results are not optimal?*

MT : *Yes, maybe because I was in a hurry. I actually knew the answer to some questions, but when I checked it again it turned out that I miscalculated or made a wrong move.*

Based on the results of interviews with MT students, it was shown that students with an impulsive cognitive style tend to work on questions quickly and without much consideration. MT admitted that he answered immediately when he felt he knew the answer, without first analyzing it in depth. MT also rarely rechecked his answers because he was worried about running out of time. In the context of algebra problems, this approach often makes him make mistakes, especially on problems that require precision in

applying formulas or calculations. This is in accordance with MT's algebra test results which are in the moderate category, with a score of 75. Although MT is aware of the potential for his mistakes, his fast and less reflective thinking style hinders his overall understanding of the concept. Thus, MT's impulsive character has a direct impact on his performance, especially in subjects that require precision such as algebra.

4. Data Triangulation Results

The following are the results of data triangulation obtained from the results of the MFFT cognitive style test, algebra ability test, and interview results of students who got the highest scores.

Table 6. Data Triangulation Results

MFFT Test Results Data of Students' Cognitive Styles
Students who have a reflective cognitive style are 4 students, namely AM, AA, PA, and MH with a time of $t > 7.28$ minutes and correct answers $f \geq 7$ questions. Students who have an impulsive cognitive style are 7 students, namely AL, FJ, MF, MZ, MC, MT, and RY with a time of $t \leq 7.28$ minutes and correct answers $f < 7$ questions.
Student Algebra Ability Test Result Data
1. The majority of students with a reflective cognitive style have a good understanding of algebraic concepts, as shown by PA students who scored 90 in the high category. The errors that occurred were generally technical in nature, such as miscalculations shown by AA students with a score of 78 in the low category. This is due to a greater focus on analysis than speed. 2. Students with less careful cognitive styles, as evidenced by frequent mistakes due to being in a hurry and not rechecking their answers, as seen in MF students with a score of 58 (low category) and RY students with a score of 60 (low category). This shows that students with impulsive cognitive styles have varying abilities in understanding concepts. Some students are able to answer simple questions well but have difficulty with complex questions, as shown in MT students with a score of 75.
Student Interview Data
The interview results showed that differences in cognitive styles significantly influenced the way students solved algebra problems. Students with a reflective style (PA) tend to be careful, thorough, and more focused on understanding concepts, so that even though it takes longer, they get high results. In contrast, students with an impulsive style (MT) tend to work on problems quickly without in-depth analysis, so they make more mistakes and get lower results. Thus, a reflective thinking style supports better conceptual understanding, while an impulsive style can hinder achievement in materials that require precision such as algebra.

Based on the results of data triangulation, students with a reflective cognitive style tend to have a better understanding of algebraic concepts, although they take longer to solve problems. This is reflected in the results of tests and interviews, where reflective students show thoroughness and in-depth analysis. In contrast, students with an impulsive style tend to work on problems quickly without careful consideration, so they make more mistakes and get lower results. Cognitive style plays an important role in influencing student performance in solving algebraic problems.

5. Discussion

The results of the algebra ability test of students showed that the average score of reflective cognitive style students was 84 and the average score of impulsive cognitive style students was 67. Based on these average scores, it can be seen that students with reflective cognitive style have a higher average score than impulsive students. This shows that a more careful and analytical approach tends to produce more accurate answers. The following are the results of the PA answers from students with a reflective cognitive style in Figure 1, and the results of the MT answers from students with an impulsive cognitive style in Figure 2.

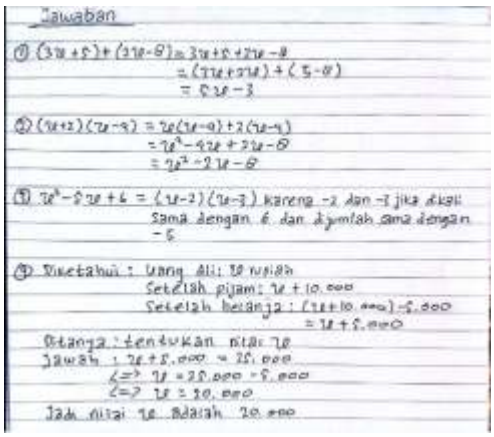

Figure 1. PA Answer Results from Students with a Reflective Cognitive Style

Based on Figure 1, it can be seen that PA students with a reflective cognitive style were able to solve all four problems correctly. The answers provided were systematically arranged and showed a clear sequence of steps for solving. This reflects a structured thinking process, where students not only focused on the final result but also presented the complete process. This pattern of answers indicates that students with a reflective cognitive style tend to be careful, consider each step, and minimize errors in solving problems.

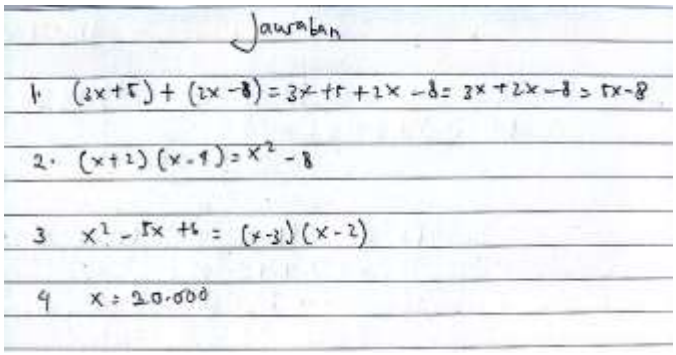

Figure 2. MT Answer Results from Students with an Impulsive Cognitive Style

Based on Figure 2, it can be seen that MT students with an impulsive cognitive style tend to answer questions quickly but less thoroughly. Of the four questions they

worked on, answer number 1 was incorrect due to an error in the addition process, and answer number 2 was also incorrect due to an error in the distribution procedure. Answer number 3 was correct, but was not accompanied by an explanation or description of the solution steps, and likewise, answer number 4, although correct, did not include the process of working on it. This indicates that students with an impulsive cognitive style tend to immediately write the final answer without thoroughly evaluating the process, thereby risking making errors in calculations and procedures.

The results of the algebra ability test of the highest score of reflective cognitive style students of 90 were obtained by PA students and the highest score of impulsive cognitive style students of 75 were obtained by MT students. While the lowest score of reflective cognitive style students of 78 was obtained by AA students and the lowest score of impulsive cognitive style students of 58 was obtained by MF students. Based on this, it is shown that the difference between the highest and lowest scores in reflective cognitive style students is smaller (12 points) compared to impulsive cognitive style students (17 points). This shows that the performance of reflective cognitive style students is more consistent, while impulsive cognitive style students tend to have greater variation in scores.

Based on these results, it can be seen that the speed of the algebraic thinking process of reflective cognitive style students tends to be slow in solving problems but produces accurate answers. The errors that occur are fewer and are usually caused by minor calculation errors. Meanwhile, the speed of algebraic thinking of impulsive cognitive style students tends to be fast in solving problems, but many answers are not quite right due to haste and lack of rechecking. Based on this, it is shown that accuracy is the main advantage of reflective cognitive style students, especially in solving problems that require in-depth analysis. On the other hand, impulsive cognitive style students excel in solving problems that require speed, although they are less consistent in accuracy.

Students with a reflective cognitive style are better suited to solving problems with a high level of difficulty. This is in line with the information processing theory proposed by Slavin, (2006), which explains that individuals with a reflective style tend to process information in depth, analyze each step, and evaluate alternative solutions before making a decision. This approach allows them to solve complex problems more effectively. This finding is also supported by Dewi & Nugraheni (n.d.) and Miatun & Nurafni (2019), who state that reflective students generally have a strong conceptual understanding and a systematic approach to solving problems.

In contrast, students with an impulsive cognitive style tend to solve problems quickly without careful consideration, so they often make mistakes, especially in problems that require precision and step-by-step reasoning. Based on the cognitive style theory by Kagan (1965), impulsive students prioritize speed over accuracy, which results in low accuracy of answers. Therefore, they need to be trained to increase metacognitive awareness and follow the stages of problem solving systematically without sacrificing speed. This is reinforced by Rismen et al. (2020), who stated that impulsive students tend to have difficulty with complex problems because they often skip several steps in solving due to being in a hurry.

Students with reflective and impulsive cognitive styles have different ways of processing information and solving problems. Therefore, the learning methods and strategies used must be adjusted to optimize the potential of both. Based on the characteristics of the algebraic thinking process possessed by reflective cognitive style students, the appropriate learning methods and strategies tend to be problem-based learning methods with a problem-solving strategy using Polya steps. While for impulsive reflective cognitive style students, the appropriate learning methods and strategies tend to be game-based learning methods with a self-monitoring strategy.

CONCLUSION

The results of the analysis that have gone through the data triangulation process, namely the combination of cognitive style test results, algebra ability tests, and student interviews show that students with a reflective cognitive style have a higher average algebra score (84) than impulsive students (67), and show more consistent performance. This is reflected in the difference between the highest and lowest scores in reflective students which is only 12 points, while in impulsive students it reaches 17 points, indicating the stability of reflective students' performance. The findings from the interviews support the quantitative results, where reflective students tend to be more careful, thorough, and focused on understanding concepts before giving answers. In contrast, impulsive students admit to working on problems quickly without in-depth analysis, which causes more technical errors.

The triangulation of the data confirms that the reflective thinking style is superior in solving complex algebra problems that require precision and deep understanding, while the impulsive style tends to be less stable in performance because it relies on speed. Therefore, in further research, it is recommended to apply the problem-based learning

method with Polya's step-based problem-solving strategy to optimize the potential of reflective students. Meanwhile, for impulsive students, a game-based learning approach can be used combined with a self-monitoring strategy to train focus and self-control in solving mathematical problems.

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